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Abstract

Background: procrastination is highly prevalent amongst students and impairs academic performance. The metacognitive model of procrastination explains a significant proportion of unintentional procrastination variance. However, the model has yet to be tested using academic performance as the dependent variable. We tested whether the metacognitive model of procrastination explained self-reported academic performance (AP). Methods: a convenience sample of 204 current undergraduate and postgraduate students completed a battery of online questionnaires that measured intentional and unintentional procrastination, metacognitions about procrastination, AP, and depression. We conducted a series of correlation analyses and a path analysis (based on the metacognitive model of procrastination) that specified AP as the dependent variable. Results: the correlation analyses indicated that there are significant, negative associations between AP and depression, AP and negative metacognitions about procrastination, and AP and unintentional procrastination. The tested model was a good fit of the data and explained 13% of the variance in AP. Limitations: this study is cross-sectional. Conclusions: our findings provide further support for the metacognitive model of procrastination, indicating that novel interventions that target metacognitions may help to tackle procrastination and optimize AP.

Keywords: procrastination; metacognition; metacognitive model of procrastination; academic performance.

Procrastination is characterised by the postponement of engaging in, or the premature termination or completion of, an activity (or activities) pursued to achieve a goal (e.g., Fernie, Bharucha, Nikcevic, & Spada, 2016). In a sample drawn from the populations of six different nations (Australia, Peru, Spain, the United Kingdom, the United States, and Venezuela), the prevalence of 'arousal' procrastination (driven by a desire for more excitement and less boredom) was 13.5% and 14.3% for 'avoidant' procrastination (motivated by task aversiveness) amongst adults (Ferrari, Díaz-Morales, O'Callaghan, Díaz, & Argumedo, 2016). The prevalence of chronic procrastination in students has been reported to be even higher: for example, Day, Mensink, and O'Sullivan (2014) estimated rates of 32%. This is problematic given the findings of a recent meta-analysis that reported a negative relationship between procrastination and academic performance (K. R. Kim & Seo, 2015). However, procrastination is not only harmful to academic performance, but also to mental well-being: e.g., it is significantly associated with anxiety and depression (e.g., Spada, Hiou, & Nikcevic, 2006; Stöber & Joormann, 2001).

Procrastination may not always be problematic; instead, it can reflect an adaptive marshalling of resources and lead to better outcomes. To this end, procrastination has been variously delineated into two subtypes: e.g., functional and dysfunctional (Ferrari, Johnson, & McCown, 1995), active and passive (Chu & Choi, 2005), and intentional and unintentional (Fernie et al., 2016). Despite these different terminologies sharing many overlapping characteristics, there are important and nuanced differences. For example, intentional procrastination (IP) refers to a deliberate and conscious (i.e., active), but not necessarily advantageous (i.e., functional), behaviour. Whilst unintentional procrastination (UP) refers to a non-deliberate behaviour that is typically both dysfunctional and passive. UP has a stronger positive association with negative affect than IP (Fernie et al., 2016), supporting the discriminate validity of these two subtypes of procrastination.

For a little over a decade, several studies have investigated procrastination from a metacognitive perspective (de Palo, Monacis, Miceli, Sinatra, & Di Nuovo, 2017; Fernie, Bharucha, Nikcevic, Marino, & Spada, 2017; Fernie et al., 2016; Fernie, McKenzie, Nikčević, Caselli, & Spada, 2015; Fernie & Spada, 2008; Fernie, Spada, Nikčević, Georgiou, & Moneta, 2009; Spada, Hiou, et al., 2006). Metacognitions (or metacognitive beliefs) are defined as beliefs that individuals hold (both implicitly and explicitly) about their own attentional strategies, behaviours, repetitive thinking processes (e.g., rumination and worry), and emotions. These studies employed the Self-Regulatory Executive Function (S-REF; Wells & Matthews, 1994, 1996) model as a framework to better understand procrastination.

The Cognitive Attentional Syndrome (CAS) is key to building clinical formulations using the S-REF model. The CAS consists of a selection of cognitive processes (e.g., rumination, self-focused attention, and worry). According to the S-REF model, psychological disorder/distress occurs when metacognitive beliefs activate and maintain perseverative CAS configurations.

Metacognitive beliefs have been broadly delineated into positive and negative subtypes. For example, a positive metacognitive belief about procrastination is “Procrastination allows creativity to occur more naturally”, whilst a negative metacognitive belief is “My procrastination is uncontrollable” (Fernie et al., 2009). Positive metacognitive beliefs about procrastination are positively associated with IP and (less so) with UP, whilst negative metacognitive beliefs about procrastination are more strongly positively associated with UP than IP (Fernie et al., 2017; Fernie et al., 2016).

Recently, a metacognitive model of procrastination (based on the S-REF model) was tested and explained 46% of the variance in UP (Fernie et al., 2017). This model conceptualises UP, and to a lesser extent IP, as components of a CAS. In this model, an individual who strongly endorses positive metacognitive beliefs about procrastination is likely to activate IP as a coping strategy to deal with being given a task. IP is positively

correlated with UP (Ferne et al., 2017; Fernie et al., 2016). It is likely challenging to engage solely in IP without slipping into UP. If the individual strongly endorses negative metacognitive beliefs about procrastination, UP (and IP) will be assessed as harmful, dangerous, and/or uncontrollable. Such appraisals will lead to worsening mood (Ferne et al., 2017; Fernie et al., 2016). To cope (i.e., to self-regulate their emotional functioning), CAS components are activated, including distraction, rumination, and worry. These processes are 'resource heavy' and contribute to cognitive or 'ego' depletion (Baumeister, Muraven, & Tice, 2000; Muraven & Baumeister, 2000). The activation of this CAS configuration means the individual's mental resources are mainly allocated to IP, UP, distraction, rumination, and worry processes. Consequently, the individual no longer has enough mental capacity to complete the original task. This paucity of mental resources makes more UP unavoidable. This aligns with a key conceptualisation of the S-REF model: i.e., psychological distress is a consequence of perseverative processes, such as UP.

Study Aims

This study had two objectives. Firstly, we sought to replicate the findings of earlier studies regarding the relationships between positive and negative metacognitive beliefs about procrastination, depressed mood, IP, and UP (e.g., Fernie et al., 2017; Fernie et al., 2016). Secondly, we aimed to test the metacognitive model of procrastination's ability to explain the mechanisms underlying the relationship between procrastination and academic performance. The current study operationalized these objectives with five experimental hypotheses (with hypotheses 1 to 3 addressing the first objective and hypotheses 4 and 5 the second). We hypothesised that: (1) positive metacognitive beliefs about procrastination would be positively and significantly related to IP and (less strongly) to UP, (2) negative metacognitive beliefs about procrastination would be positively and significantly associated with UP, (3) UP would have a stronger positive relationship with depressed mood than IP, (4) positive and

negative metacognitive beliefs about procrastination would have significant and negative indirect effects on self-reported academic performance, and (5) the metacognitive model of procrastination, using self-reported academic performance as the dependent variable, would be a good fit of the data.

Method

Participants

Study eligibility criteria required that participants: (1) were at least 18 years of age, (2) were current undergraduate or postgraduate students, (3) had received at least one assessment for a piece of coursework or exam for their current course within the last 12 months, (4) possessed adequate English language skills, and (5) consented to participate. Two hundred and forty-six (191 female) participants were initially recruited from students at King's College London and the University of Liverpool (and, in addition, from the advertisements placed on social media by the first two authors). However, using list-wise deletion to allow bootstrapping in the later analyses, 204 (160 female) participants contributed complete datasets for this study.

The mean age of participants were 23.60 years (ranging from 18 to 65; $SD = 5.89$). Most (138; 67.6%) participants self-identified as ethnically White, whilst the remainder as Asian (24; 11.8%), Black (4; 2.0%), Mixed (5; 2.5%), or preferred not to say (33; 16.2%). In terms of nationality, most participants (123; 60.3%) described themselves as British. The remaining sample self-identified nationalities from Africa, Asia, continental Europe, Oceania, and South America. 183 (89.7%) of the sample reported that they were currently attending universities located in the United Kingdom. The next largest group that contributed data stated that they were studying at universities based in Turkey (12 participant 5.9% of the sample). Students studying at universities in Belgian, the Czech Republic, France, Singapore, Switzerland, and the United States also participated in this study. Despite the wide range of

nationalities sampled, all participants rated their comprehension of written English as at least adequate. 128 (62.7%) participants reported that they were current undergraduate students whilst the rest (76; 37.3%) described themselves as current postgraduate students. Most were full-time students (193; 94.6%) and the remainder part-time (11; 5.4%). 84.8% (173) of participants were in the first three years of their course, with remaining 15.2% (31) being in their fourth or later year.

Measures

Measuring contemporaneous academic performance. Participants were asked to self-report between one and five of their most recent numbered marks for academic work received within the last 12 months. They were also asked to state what the highest achievable score was (i.e., out of 10, 80, 100, etc.). Each mark record was divided by the highest score possible to generate a ratio score. The number of ratio scores gathered for each participant (k) varied. Mean ratio scores were calculated for each participant by summing their ratio scores and dividing by k , generating a single variable to indicate current academic performance (referred to as 'AP' in the later analyses).

Self-report scales. We employed several validated psychometric questionnaires to assess intentional and unintentional procrastination, metacognitive beliefs, and depression. To measure procrastination we used the 'Intentional Decision to Procrastinate' (IDP) factor of the Active Procrastination Scale (APS; Choi & Moran, 2009) and the Unintentional Procrastination Scale (UPS; Fernie et al., 2016). The IDP factor of the APS was used to assess IP and contains four items, including "I intentionally put off work to maximize my motivation." and "To use my time more efficiently, I deliberately postpone some tasks.". Participants are required to indicate the extent to which they agree with such statements on a four-point, Likert-type scale ranging from "disagree" (scoring one) to "agree" (scoring four). The responses are summed, so that higher scores reflect greater levels of IP. The IDP factor of

the APS has been reported to possess good validity and adequate internal consistency (Choi & Moran, 2009). The UPS assesses UP and consists of six items, such as “Often I mean to be doing something, but it seems that sometimes I just don’t get around to it.” and “I really want to get things finished in time, but I rarely do.”. Participants indicate their strength of belief in the items on a four-point, Likert-type scale, ranging from “do not agree” (scoring one) to “agree very much” (scoring four). Responses are totalled, and higher scores indicate greater levels of UP. The UPS possesses discriminant, construct, and concurrent validity, as well as good internal consistency (Ferne et al., 2016).

Metacognitions about Procrastination Scale (MaPS) was used to assess conviction in metacognitive beliefs about procrastination (Ferne et al., 2009). The MaPS consists of two, eight-item factors that assess positive metacognitive beliefs about procrastination (PMP) and negative metacognitive beliefs about procrastination (NMP). An example item of an item from the PMP factor is “Procrastination stops me from doing things when I am not ready.” and for the NMP factor is “Procrastination can be harmful.”. In terms of concurrent validity, both PMP and NMP have been shown to be significantly correlated with several different measures of procrastination (de Palo et al., 2017; Ferne et al., 2016; Ferne et al., 2009). The MaPS uses a four-point, Likert-type scale, ranging from “do not agree” (scoring one) to “agree very much” (scoring four). Higher scores on either factor (which are summed separately) indicate a greater endorsement of positive and/or negative metacognitive beliefs about procrastination. Both factors have good internal consistency (Ferne et al., 2009).

We used the Patient Health Questionnaire 8 (PHQ-8) to assess depressive symptoms. The PHQ-8 consists of the first eight items of the Patient Health Questionnaire 9 (Kroenke, Spitzer, & Williams, 2001), omitting the latter’s item that assesses suicidality. The PHQ-8 possesses good psychometric properties, with respondents indicating the level they have experienced the symptoms described by the items (e.g., “Feeling down or depressed.”) over the

preceding two-weeks on a four-point, Likert-type scale that ranges from “not at all” (scoring zero) to “nearly all the time” (scoring three). Responses to all items are summed together, meaning higher scores indicate the presence of greater levels of depressive symptoms (Kroenke et al., 2001).

Procedure

Ethics approval was obtained both by King’s College London (HR15/16-2486) and the University of Liverpool (RETH001065). Additionally, all procedures performed in this study were conducted in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Email circulars from the universities advertised a web link that directed potential participants to the study website containing the questionnaires. Additionally, the first and second authors also used social media to encourage individuals to consider visiting the study website. The first two pages of the website provided information regarding the purpose of the study, describing that responses were anonymous, and that consent would be assumed once participants click on the ‘submit’ button following the battery of questionnaires. In the pages following this information, as well as the study questionnaires and academic performance questions, participants were asked to record their demographic details. Participants were not required to record their names. They were informed that once they click the submit button, it would not be possible to withdraw their data from the study because it would be uploaded in an anonymous form.

Data Analysis

Mean ratio assessment-scores, using participants’ self-reported AP, were calculated and the distribution of the data obtained from the study’s measures were tested for normality. The results of these tests determined whether parametric or non-parametric correlation analyses were calculated to indicate the nature of the relationships between the study variables. The fit

of a metacognitive model of procrastination (Ferne et al., 2017), modified to make AP the dependent variable, was tested using path analysis. The assumption of multivariate normality was assessed by calculating Mardia's coefficient to help determine the method of estimation for the path analysis.

Results

Normality Tests and Correlation Analyses

Kolmogorov-Smirnov tests revealed the distribution of age, IDP, UPS, PHQ-8, PMP, NMP, and AP data were all significantly different from normal. Spearman's rho analyses generated the correlation matrix shown in Table 1. These analyses were used to test the first three of the study's hypotheses. They revealed that PMP was more strongly positively and significantly associated with IDP than UPS (hypothesis 1), NMP was positively and significantly related to UPS (hypothesis 2), and UPS was positively and significantly correlated with PHQ-8 whilst IDP was not significantly related to PHQ-8 (hypothesis 3).

Metacognitive Model of Procrastination and Academic Performance

The study tested a modified metacognitive model of procrastination (Ferne et al., 2017), which employed self-reported AP as the dependent variable rather than UPS (see Figure 1). AMOS (Arbuckle, 2015) was used to test the pattern of relationships in the model using path analysis (bootstrap = 1000; $CI = 95\%$). Although Kolmogorov-Smirnov tests showed the study data was non-normally distributed, subsequent tests of univariate skewness and kurtosis and multivariate normality (Mardia's coefficient = -0.214) suggested the model could be fitted using Maximum Likelihood Estimation (H. Y. Kim, 2013).

In the model, all estimated coefficients were significant at a minimum of $p < .05$ and together they explained 13% of the total variance in AP (see Figure 1). PMP was significantly associated with increased IDP, UPS, and PHQ-8 scores. Higher IDP, NMP, PMP, and PHQ-8 scores were all significantly related to greater levels of UPS. There were positive and

significant direct effects of both PMP and NMP on PHQ-8. The direct effect of UPS on AP was negative and significant. There were significant indirect effects (not shown in Figure 1) of both PMP and NMP on UPS and AP (PMP on UPS: $\beta = .10, p < .01, 95\% CI [.03, .19]$; NMP on UPS: $\beta = .11, p < .01, 95\% CI [.05, .17]$; PMP on AP: $\beta = -.10, p < .01, 95\% CI [-.15, -.05]$; NMP on AP: $\beta = -.19, p < .01, 95\% CI [-.26, -.12]$. The signs of the betas indicated stronger endorsement of PMP and NMP was associated with greater levels of UPS and poorer AP (hypothesis 4). Also, there was a significant negative indirect effect of PHQ-8 on AP via UPS ($\beta = -.09, p < .01, 95\% CI [-.16, -.04]$), but the indirect effect of IDP on AP via UPS was non-significant ($\beta = -.05, p > .05, 95\% CI [-.10, >.00]$).

Both absolute (i.e., the chi-square/df ratio [CMIN/DF] and the root mean square error of approximation [RMSEA]) and incremental (i.e., the comparative fit index [CFI], the global fit index [GFI], and the Tucker-Lewis index [TLI; the non-normed fit index]) indices were calculated. A good fit is indicated by threshold values of greater than one but less than five for the CMIN/DF, equal to or less than 0.08 for the RMSEA (Browne & Cudeck, 1993), and close to, or above, 0.95 for the CFI, GFI, and TLI (Schermelleh-Engel, Moosbrugger, & Müller, 2003). All indices indicated the model was a good fit of the data, CMIN/DF = 1.232; RMSEA = 0.034, $90\% CI [< 0.001, 0.102]$; CFI = 0.99; GFI = 0.99; TLI = 0.98 (hypothesis 5).

Discussion

The results supported all five of the studies hypotheses. Firstly, PMP were positively and significantly related to IDP and (less strongly) to UPS. Secondly, NMP were positively and significantly associated with UPS. Thirdly, UPS had a stronger positive relationship with PHQ-8 than IDP. Fourthly, PMP and NMP had a negative and significant effect on AP. Fifthly, the metacognitive model of procrastination (with AP as the dependent variable) was an excellent fit of the data. Whilst this current paper did not directly assess CAS activation, it

incorporated measures of PMP and NMP, as well as IP and UP, with pathways that mirrored the original model presented by Fernie et al. (2017).

This study's findings offered further evidence PMP play a more important role in IP (as measured by the IDP) than UP (UPS), and that the reverse is true for NMP. Additionally, the results suggested that UP is a stronger marker of psychopathology than IP. This finding offered further evidence of the discriminant validity of the UPS (Fernie et al., 2016).

Whilst both PMP and NMP had negative and significant indirect effects on AP, the path analysis suggested NMP had a greater influence on AP than PMP. The indirect effect of PMP on AP was via IP, UP, and depressed mood (PHQ-8), whilst NMP on AP was via depressed mood and UP. Our model did not specify a direct causal pathway between PMP and NMP, yet their impact on AP seems to be moderated by variables that are influenced by each other. For example, NMP's direct and indirect effects on UP (which had a negative and significant direct effect on AP) was stronger than PMP's, whilst depressed mood had a positive and significant direct effect on UP. Although both PMP and NMP had positive and significant direct effects on depressed mood, the influence of the former was weaker than the latter. This could indicate NMP play a greater role in UP and AP than PMP. Perhaps the primary role of PMP in UP and AP is activating IP coping strategies, which bring NMP online. This interpretation aligns with the metacognitive model of procrastination.

Earlier studies have shown that metacognitive beliefs about worry are associated with test anxiety (e.g., O'Carroll & Fisher, 2013; Spada, Nikcevic, Moneta, & Ireson, 2006), which has been frequently associated with poor AP (e.g., Cassady & Johnson, 2002). Additionally, CAS configurations characterised by maladaptive metacognitive beliefs about worry have shown to be predictive of a 'surface' approach to studying (i.e., a superficial approach, reliant on rote learning), and, in turn, AP (Spada & Moneta, 2012, 2013). However, the current study

is the first to explore the relationship between academic performance and metacognitive beliefs about procrastination rather than metacognitive beliefs about worry.

Limitations

This study has several limitations. First, social desirability, self-report biases, context effects, and poor recall may have contributed to errors in the self-report measurements. Second, a cross-sectional design was adopted, and this does not allow causal inferences. Third, this study utilized self-report measures to assess subjective experience and meta-awareness and as such, like much cognitive research, there is always doubt whether we are measuring the constructs we intend. Fourth, there were issues with the sample characteristics that limit the generalizability of our findings: i.e., the sample was skewed towards female, ethnically White, and British participants. Fifth, this study did not directly measure CAS activation and therefore cannot completely test the original metacognitive model of procrastination (Fernie et al., 2017). Finally, the variable we used to represent academic performance was calculated from self-report data. Although, the impact of this potential source of social desirability bias might have been attenuated because all study data was gathered anonymously via the Internet.

Conclusions

Despite this study's limitations, it provides evidence that the metacognitive model of procrastination explains a significant proportion of the variance in the AP of current undergraduate and postgraduate students. Indeed, the 13% variance in AP explained by this model could be vital for many students. For some, it could represent the difference between passing and failing a course, whilst for others it could be the difference between achieving a higher or lower grade, which might determine whether they are accepted on a further course of study or determine the direction of their future career. This highlights the potential benefit of developing a psychological intervention package to address procrastination using techniques targeting metacognitive beliefs about procrastination.

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Table 1: Means, SDs, and Ranges of Study Variables, and Correlation Matrix

Variable	x	SD	Range	2	3	4	5	6	7
1. Age	23.60	5.89	18-65	.04	-.07	-.16*	-.08	.01	.00
2. IDP	11.77	4.08	4-20		.16*	.01	.48**	-.15*	-.09
3. UPS	15.85	5.43	6-24			.40**	.19**	.46**	-.38**
4. PHQ-8	15.43	5.44	8-32				.11	.37**	-.22**
5. PMP	15.23	4.02	8-29					-.16*	-.03
6. NMP	21.74	5.95	8-32						-.24**
7. AP	0.72	0.10	0.45-0.97						

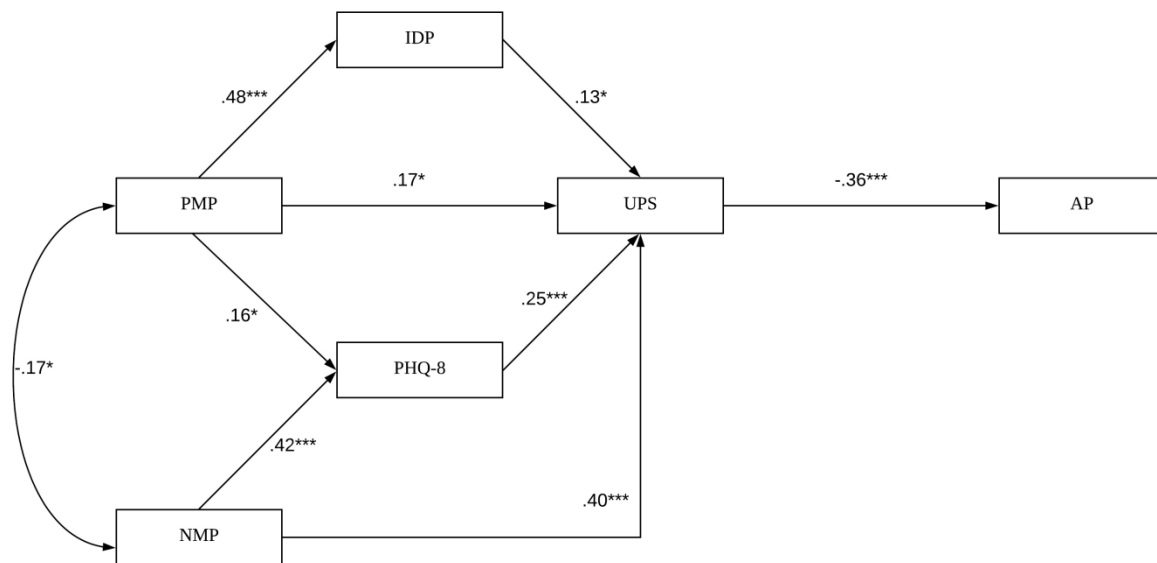
Note. IDP = Intentional Decision to Procrastinate; UPS = Unintentional Procrastination Scale;

PHQ-8 = Patient Health Questionnaire 8; PMP = Positive Metacognitions about

Procrastination; NMP = Negative Metacognitions about Procrastination; AP = academic

performance; $n = 204$; * = $p < .05$; ** = $p < .01$.

Figure 1: Standardized Path Coefficients for the Metacognitive Model of Procrastination with Academic Performance as the Dependent Variable



Note. IDP = Intentional Decision to Procrastinate; UPS = Unintentional Procrastination Scale; PHQ-8 = Patient Health Questionnaire 8; PMP = Positive Metacognitions about Procrastination; NMP = Negative Metacognitions about Procrastination; AP = academic performance; $n = 204$; * = $p < .05$; *** = $p < .001$.

Conflict of Interests Statement

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

A handwritten signature in black ink, appearing to be 'BN' followed by a stylized flourish.

13/05/18

Author Declaration

Contributors

We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us.

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Authors BAF, UYK, MMS, and PF contributed the design of the study and write-up of the paper. Authors BAF and UYK collected data for the study. Author BAF performed the statistical analysis of the data.

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